Report of the Accelerator Systems Advisory Committee
Of the Spallation Neutron Source
February, 2002 Meeting

Introduction

The sixth meeting of the Accelerator Systems Advisory Committee (ASAC) for the Spallation Neutron Source was held on February 12 - 14, 2002 at the SNS Office in Oak Ridge, Tennessee. The committee membership is: M. Allen (SLAC), D. Boussard (CERN), A. Chao (SLAC), D. Finley (Fermilab), M. Harrison (BNL), R. Jameson (LANL), J.-L. Laclare (CEA, Saclay), W. McDowell (ANL), G. McMichael (ANL), D. Proch (DESY), G. Rees (RAL), P. Schmor (TRIUMF), and R. Siemann (SLAC, Chair). M. Allen, D. Boussard, and J.-L. Laclare were unable to attend, and R. Kustom (ANL) joined the committee for this meeting.

This was the final ASAC meeting for Bill Weng who was one of the original SNS Senior Team Leaders. We wish Bill the best in his future endeavors.

Charge to Committee

I. Provide an assessment of the physics and technical progress on the project. Does the committee see any serious problem areas?

II. Are there technology designs that could be improved within the constraints of funding and schedules? Are there any problem areas that might be potential show stoppers?

III. Given the results from the 200 MeV beam test of the laser profile monitor and the status of the system design, is ASD in a position to proceed with the laser profile monitors?

IV. Provide an assessment of the Lorentz Force detuning issues. Comment on the ongoing R&D program to implement active feedback with piezo tuners and advise on any additional R&D steps to be taken.

V. Provide an overall assessment of all aspects of the commissioning plans.

General Assessment

There continues to be impressive progress on the SNS. Conventional construction has advanced to the stage where one can see the final layout of the facility and parts of the Front End and Linac buildings will be available for installation during the summer and fall. ORNL is taking a dominant role in the installation, commissioning and operation of the SNS accelerator. The Accelerator Systems Division has attracted outstanding people who have taken ownership of the accelerator.

Commissioning

Commissioning was a major theme of this meeting. Experienced "Area Managers" have been assigned to four accelerators: the Front End, the Warm Linac, the Superconducting Linac, and the Accumulator Ring. They have generated detailed commissioning plans starting with preparations before beam is available and continuing through the work to be completed with beam. The emphasis is on achieving the DOE "Project Completion" (CD-4) performance as early as possible.

The plans have pulled together many aspects of beam physics, engineering, diagnostics, controls, and application software. This is important because instrumentation, diagnostics, and well-tested application codes are all critical for efficient and effective commissioning, and the planning is forming a basis for understanding and prioritizing the likely needs. We note that a significant amount of hardware checkout can be accomplished before beam is available, and some attention should be given to potential pre-beam tests. These tests, including the schedule, would be a good topic for the next ASAC meeting.

The ORNL technical staff has been steadily growing in number, importance and expertise, and their expertise will continue to grow during equipment testing and commissioning periods. Nevertheless, budgetary constraints have resulted in a relatively lean projected staffing level. The partner laboratories have experienced engineers and physicists who will have constructed the SNS accelerators. They are a unique resource, and the intra-laboratory agreements should recognize that these people are likely to be needed during initial commissioning. The "change of station" agreement between LANL and ORNL is a laudable model for accomplishing this. Possible use of contingency funds for additional personnel during critical phases would be a highly leveraged way to augment core staff for short periods.

There are formal requirements to ensure that commissioning is done safely and within approved operating envelopes. The plans for the shielding, safety systems, documentation, etc. needed to meet these requirements are being developed in parallel, and are consistent with the accelerator commissioning plans.

Overall, commissioning plans appear to be well thought out and thorough for this stage of the project. They should be updated in the future so that they function as the working plan for the SNS commissioning.

Operational Aspects and Reliability

A high level of reliability is a priority for the neutron scattering community. The ultimate goal for SNS operation is 5000 hours per year at full beam power of 1.4 MW with 95% reliability. In past reports we have stated our opinion *i)* that reliability did not appear to be an important consideration in the design, and *ii)* that it was important to develop realistic goals for the initial reliability and for the rate of improvement over the first years of operation. Thom Mason and Norbert Holtkamp have written a discussion paper about the transition from commissioning to fully committed user operation. It is a good start giving the user community information needed for planning their research programs and for setting Accelerator Systems Division goals.

The DOE CD-4 goals are: *i)* delivering 10^{13} protons to the target, *ii)* installation of the equipment needed for a 1 MW power level, and *iii)* demonstrated satisfactory neutron performance of the target. The present emphasis is on meeting these goals. This is appropriate. Substantial work will remain after Project Completion to reach the ultimate performance. The discussion paper has the ultimate performance being reached four to five years later. Improvements needed for high reliability and routine delivery of high beam power will require substantial human and monetary resources over this period of time, and these are being included in operating budget submissions to the DOE. These resources will be needed for the SNS to reach its full scientific potential.

The emphasis on Project Completion is appropriate, but care is needed, as decisions made now will affect the project over its full lifetime. Options that are inexpensive now but costly to retrofit should be implemented if possible. Site engineering designs should concentrate on long term issues associated with ease of access and ease of maintenance of active accelerator components, including vacuum leak testing and replacement of faulty items. Exposure of staff to radiation during maintenance in the tunnels can be greatly reduced by the standardization of quick release vacuum flanges, quick release water fittings, and, in particular, the use of kinematic mounts for hardware items to allow pre-alignment of replacement items outside the tunnels. This issue is best understood through detailed plans for the proposed movement of components and replacement items in the linac, the beam lines and the accumulator ring tunnels.

Front End and Linac Halo

We offer our congratulations to the Front End team for their accomplishments since the last meeting.

Many outstanding issues related to the ion source and LEBT have been satisfactorily addressed

- There is improved understanding of background noise in the emittance diagnostic, and the emittance from the new analysis is what one would expect from a multicusp ion source. Values of 0.22 π mm-mrad and 0.15 π mm-mrad at 33 mA in the horizontal and vertical, respectively, meet the CD-4 requirement. It is important that these emittance measurements have been carried out at a location where the beam has not strongly diverged, so details of the phase-space core and underlying halo are observed with good accuracy. The measurements show the lens aberrations and underlying halos that are present on the LEBT beam. A realistic particle distribution has been generated from the measurements and used for simulation studies of the subsequent linac.
- Cherokee Porcelain Enamel Corp. in collaboration with ORNL has developed a coating technique that produces uniform, thick coatings of porcelain on ion source antennae. Ion source lifetime has been extended to an acceptable level as a result.
- The first extended operation of the ion source and LEBT took place starting in late October 2001. Beam was delivered for 65% of a scheduled 8-day period. This test had a number of valuable outcomes including revealing some weaknesses that have been corrected, and bringing together the Front End teams from LBNL and ORNL.

The first commissioning of the RFQ with beam has been very well accomplished. The initial tests were performed as usual with a low duty factor (0.1%). Conditioning to high voltage was fast, indicating good engineering and vacuum practice. First tests of an RFQ usually measure beam transmission vs. input RF power, comparing the curve to the predicted performance, and calibrating the RF power using x-ray emission measurements. The initial measurements that were performed indicate that the performance is close to prediction. The initial beam performance from the ion source through the LEBT and the RFQ was successfully demonstrated in terms of transmission. This successful commissioning is a major milestone for the SNS project.

The Front End will be at LBNL until the end of May when it will be shut down and prepared for shipment to ORNL. A large number of tests are planned for diagnostics, MEBT commissioning, etc. during the remaining time at LBNL. An initial operation test of the RFQ (and, if possible, the MEBT also) is one of the most important ones that should be a high priority and performed even at the cost of delaying others until the Front End is re-commissioned at ORNL. This test should be around the clock for roughly one week, with beam, and at full duty factor. It is essential to gain confidence that full operation can be achieved without sparking or other phenomena.

It is important that work continue to carefully characterize the RFQ output beam for further simulation studies and operations. The initial emittance measurements are with strongly diverged beam, so only a narrow line in phase space is observed. As with the LEBT, it is necessary to measure the beam closer to a waist to resolve details. When this is done, it may also be possible to observe underlying distributions of other ions, such as H_0 or non-hydrogen ions that are typically seen in a system of this kind and to distinguish these ions from other effects such as the unaccelerated beam predicted by the simulations, slit scattering, etc. In the normal conducting part of the linac, an important item identified for detailed study is the fate of partially chopped bunches, both in and after the RFQ and MEBT. It is recommended that experiments be made using dc voltages on the LEBT chopper plates to simulate partial chopping to study the effect of the pre-chopping in the LEBT on beam loss and halo growth. Study areas include the scale of the beam loss in the RFQ, possible beam loss at the MEBT chopper plates, and the effectiveness of the MEBT chopper target and collimators in removing partially chopped bunches. Beam halo remaining after the MEBT should be measured and used as input for beam loss, tracking studies in the DTL and CCL.

Simulations show beam loss in the DTL and CCL. These losses can be traced to an unequal beam aspect ratio in the MEBT and are seen in simulations starting with either the LEBT output beam or an ideal waterbag distribution. Specific approaches to mitigate the beam loss have been investigated, and the results reported in "Linac Halo Mitigation", SNS 104050000-TD0010-R01. We fully endorse the conclusions of that report, which are

- Collimators in the DTL do not mitigate the halo, which by then has already developed, and extra beam interception there would severely overheat the drift tubes.
- Treating the halo at its source in the MEBT is effective. A combination of MEBT scraping and alternative MEBT optics can reduce the DTL losses to a low level. Space is available for the scrapers, and three additional power supplies would provide independent control of MEBT optical elements. The costs are modest.

Initial studies of matching in the MEBT (modified as above and considering expected measurement errors) indicated that the match should be good enough that no losses would be seen downstream. Matching studies are continuing. It will be important for MEBT beam commissioning (and later DTL Tank 1 beam commissioning with the D-Plate) that the beam be near a waist for good resolution of the emittance. The diagnostics should be reviewed for this feature.

The initial Front End commissioning is in progress at LBNL. It will provide valuable initial experience and an opportunity for ORNL staff to learn about the system before it is transferred to the SNS starting in June. Plans call for installation and subsequent equipment testing at Oak Ridge to be completed by the end of October 2002, and commissioning is to take place in November and December 2002. The goals include obtaining beam from the RFQ with the design energy and emittance, transporting the beam through the MEBT with low loss and the required time structure from the choppers, and demonstrating that the beam can be matched into the DTL. All systems will be tested at full power. Tuning algorithms have been thought through and simulated using a "virtual accelerator" that is interfaced with the EPICS control system. This thorough planning will provide a solid foundation for the Front End commissioning that is less than nine months away.

Linac Commissioning

The linac commissioning plans are thorough and well thought through. They emphasize achieving performance required for CD-4 as early as possible. The schedule provides a total of two years for the commissioning of the six DTL tanks, four CCL modules, and twenty-four SRF cryomodules. This seems adequate and possibly generous in total, but more than half of this time (Feb 2003 through April 2004) is devoted to the DTL, which only constitutes 8% of the linac. In contrast, eleven weeks are scheduled for the twenty-four SRF modules that are 80% of the linac with 81 cavities and RF systems. The schedule for this part of the linac commissioning is "success-oriented" and is based on the assumption that all subsystems have been commissioned and operated to full power without beam, prior to installation. It does not appear unreasonable given that assumption, however little information on this pre-installation activity was available, and it is recommended that this be a subject for presentation at the next ASAC meeting.

Superconducting RF

There is substantial progress in coupler development during the last year. Three pairs of prototype couplers were conditioned with high power at LANL. In the last test traveling RF power of 2 MW was transferred through the couplers. At this power level the RF field is equal to reflective conditions during the transients when filling and emptying the superconducting cavity at 500 KW forward power. The collaborative effort between LANL and Jlab that produced these results is recognized and applauded.

Input coupler operation at cryogenic conditions remains to be demonstrated. The coupler production order will be placed on 1 April 2002. Therefore, the integrated system test of the prototype cryostat with the input couplers attached to the cavities should be conducted as soon as possible.

Unexpected softening of the niobium material after heat treatment at 800 C was reported. Heating removes hydrogen from niobium, and the cavities suffer from "Q-disease" (degradation of the superconducting quality factor) if this is not done. A measurement of a chemical cleaned (Buffered Chemical Polish) cavity showed no Q-disease and less softening after a moderate bake at 600 C. Electro-polishing is planned for high gradients, and hydrogen is produced during the electro-polishing process. Therefore, the result from a moderate bake of chemical cleaned cavity is not conclusive for electro-polished cavities. The effect of a moderate bake on Q-disease must be verified on electro-polished cavities, and promising procedures should have demonstrated effectiveness as cures. Single cell cavities made from the SNS niobium material could serve as fast turn around test vehicles. Intensive material science investigation in collaboration with the niobium vendors to understand the metallurgical specialty of the SNS niobium is advised in parallel to the cavity work.

The Lorentz force of the RF fields deforms the cavity shape and results in detuning the resonant frequency. The sensitivity of the static deformation is given by K, which is the proportionality factor between the square of the electric field and the change of resonant frequency. K values between 3 and 6 Hz/(MeV/m)^2 were assumed in the presentations. The effect of transient detuning of the cavity during fill and flattop was reported with respect to required overhead RF power and demands on the control electronics. Under the assumptions of *i)* K = 6 Hz/(MeV/m)^2, *ii)* static pretuning of -200 Hz, and *iii)* an operating gradient of 10 MeV/m, the required overhead of RF power would not exceed 10%. But active compensation by a piezoelectric tuner will be required at higher gradients or to counteract mechanical resonances. Therefore, the present investigations on the piezoelectric tuner design are endorsed.

Measured K values of the "dressed" cavity including the contributions of tuner and liquid helium vessel are urgently needed for a realistic calculation of Lorentz force detuning. Furthermore, the unusual mechanical properties that the SNS niobium material showed might influence the static and dynamic detuning. This effect must be explored with a series production cavity assembled in the cryomodule. A piezoelectric tuner should be incorporated to serve as very effective motion sensors as well as active elements to demonstrate the mitigation of the Lorentz force detuning.

The Lorentz force can initiate cavity shape oscillations that could affect the next beam pulse. This has been experimentally verified at several laboratories. ESS has evaluated the issue of ringing until the next pulse, and for their case the low-level RF and reserve amplifier power should be able to handle the situation. This work should be reviewed and applied to the SNS case. The presented calculations of Lorentz force detuning are based on first order differential equations, and second order differential equations are required to describe ringing. We encourage conducting appropriate calculations and simulations and comparing the results with experimental results from the cryomodule prototype test. Appropriate operation of the piezoelectric tuners can only be determined on the basis of these experimental observations.

Several of the issues discussed above had a common conclusion: An integrated system test of the prototype cryostat should be prepared and conducted with high priority. The reasons are repeated here to emphasize the recommendation

- Input coupler operation at cryogenic conditions remains to be demonstrated, and the order for coupler production will be placed soon.
- Measured K values of the "dressed" cavity including the contributions of tuner and liquid helium vessel are urgently needed for a realistic calculation of Lorentz force detuning.
- Experimental data are needed to determine the appropriate operation of the piezoelectric tuners.

Linac RF Systems

This is a critical year for the linac RF systems. Major components and systems are undergoing tests and first article deliveries. These must be successful, and all major subsystems must make deliveries to ORNL in the coming year. The modules for the low level RF controls are making good progress, and system integration tests are planned during the first half of 2002. The first transmitters are scheduled for delivery over the next six months. The prototype converter-modulator is being rebuilt to repair a secondary winding failure and to incorporate upgrades, and production components are under contract. First articles of the 550 kW, 805 MHz klystrons are scheduled for testing, and the first 5 MW, 805 MHz klystron is scheduled for testing in May 2002. This klystron is needed for a test stand at LANL to test high power components that have been delivered already

The 402.5 MHz klystrons remain a substantial problem. Delivery is a year behind schedule, and the first two tubes developed instabilities at much less than the rated power of 2.5 MW. External waveguide modifications may result in reduced performance adequate for some testing and for powering some of the linac. The schedule for tubes that meet all the specifications is uncertain, and the long-term viability of the present manufacturer is unclear. LANL has taken necessary steps dealing with the manufacturer including frequent phone and video conferences and sending an engineer to work with the manufacturer. ORNL has taken the lead to find an alternative supplier, and the estimate is that such a supplier would begin delivery 14 months after an order was placed. These actions are reasonable and necessary, but klystron availability could affect RFQ and DTL commissioning, and a reliable supplier is needed for the future.

The present implementation of the RF system would require the accelerator to be shutdown if a klystron, transmitter, or modulator failed. This will have to be remedied in the future to reach the desired reliability. Providing for capability for switching the klystron high voltage power supplies should be considered now to avoid a costly retrofit in the future.

High power RF testing will be an ongoing SNS need, and plans should be developed for high power tests stands at ORNL.

Accumulator Ring

This section covers various aspects of the presentations about the accumulator ring.

The measured integral transfer functions of the ring dipoles showed an unexpected magnet-to-magnet fluctuation of up to ~0.1%. The leading candidate considered to cure this problem at the time of the meeting was a combination of transverse displacements of these sector-magnets (up to 1.8 cm) and magnet sorting in their installation. We did not consider this an acceptable solution and urged that alternate solutions be considered. It was shown shortly after the ASAC meeting that shims reduced the error significantly.

Magnetic measurements of the first ring quadrupole were presented. The ring and the HEBT share a common quadrupole design with shaped pole tips and chamfers. The measurements show a sextupole moment that is acceptable for the ring, which has more stringent requirements than the transfer lines. We look forward to seeing the results of measurements of the complete sets of shimmed dipoles and quadrupoles at a future meeting.

Some of the ring devices, such as those in the injection area, are quite complex both mechanically and magnetically. These unique devices should be thoroughly checked out and measured to assure their proper performance in the ring. One example (although not the only one) is to assure that the magnetic field along the path of the stripped electrons will indeed lead them to the collection point.

The electron cloud instability has been studied, mainly by a comparison with the PSR, and by simulations. Preliminary results show the problem should be more tolerable than in the PSR, but there are uncertainties in the theory and substantive differences between the SNS ring and the PSR. One example is that the proton losses in the SNS will be concentrated at the collimators and a few associated regions. Given the uncertainties, study of the electron cloud instability should continue and possible corrective actions foreseen. An example is reserving space near high loss regions for possible inclusion of clearing electrodes.

Stripped electrons will deposit about 2 kW of average power in the dump. This poses two concerns. The first is that backscattered electrons may contribute to the electron cloud instability. Calculations show that this is not a concern, but it should be considered in the ongoing studies of the electron cloud instability. The second concern is whether the dump can withstand the deposition of 34 J in 1 msec at 60 Hz. To this end, the original copper dump has been replaced with a carbon-carbon dump design, which takes advantage of the best available material. Even so, ANSYS calculations indicate the dump will need to be replaced every two years or so. It is important to be assured that the lifetime is not significantly less than this.

An impedance budget had been established in the past. That budget should be updated regularly as component design and construction progress. The impedance budget would then be a living engineering control document that would serve the function of impedance monitoring and policing. Key components will need to be bench measured as part of this effort. The extraction kicker (below) provides a good example. Impedance policing is especially relevant because the instability threshold is within a factor of two of the design current, and without careful monitoring during construction the impedance has the potential of becoming a serious limiting factor at a later time.

The extraction kicker system has a total vertical transverse coupling impedance of 74 kΩ/m. Work has been done on the design of the pulse forming network and the impedance measurements of the extraction kicker. Such concentrated attention is appropriate on this important component of the ring, and it should be continued with an effort made to reduce the transverse impedance.

Work on collective instabilities is ongoing, and, while appropriate issues being studied, we have concern about depth and breadth because of the potential that instabilities have for determining the SNS performance limit. A systematic in-depth survey of collective instability issues for the SNS is recommended. The survey should identify all collective effects expected to play a role in the SNS operation, list the present uncertainties, and suggest potential cures for these uncertainties. The CD-4 level of performance, high beam currents, and halo generation due to instabilities should all be considered.

A resonance-based loss model has been proposed before, and is being extended. In particular, it has been used to predict the time structure of the beam loss and the maximum beam intensity that can be stored in the ring. This study provides good guidance to what is expected and is a worthwhile effort. The next study should include resonance compensations for those resonances between 1/4 and integral values and 3-dimensional space charge effects.

Details of commissioning of the ring and associated transport lines were presented. These plans appear to be well thought out and thorough for this stage of the project. About 300 individual tasks have been identified and prioritized. The initial commissioning schedule allows for six months to bring low intensity beam through the HEBT and accumulator ring to the extraction dump. This is a reasonable length of time to accomplish these tasks.

Controls and Application Programming

Good progress has been made with controls since the last ASAC meeting, and the Controls Group is on schedule and expected to be ready for commissioning. The control system is being used at LBNL to control the Front End, and many of the EPICS packages needed by Sverdrup for conventional facility controls are complete. Timing, machine protection, and personnel protection systems have had engineering screens developed and are being operated and checked out by the technical staff.

A Control System security model is in place. The Control System will be on an isolated network and protected by a Firewall. All routers employ Access Security Lists to limit access, and all switches employ port-based security. This means that the accelerator network is private and physically isolated from the external network (except via NAT in the router). EPICS Channel Access Security is used to control "read/write" access to the EPICS IOC's.

Controls is to be complimented for using software version control system (CVS) to track changes in production/commissioning software. It is noted that Diagnostics and the Applications are also using this system. It should be expanded to control the development of PLD and PLC software.

Controls is developing support for applications programming, diagnostics, and physics. EPICS interfaces to Matlab, and Labview are being developed. Progress is being made on integrating EPICS into the PC environment to better support the Diagnostics systems. In particular, running IOC core software on the Diagnostics network attached devices (NAD) is a good way to enhance flexibility and provide good support to the commissioning program.

"Fast feedback" proved to be an invaluable technique for stabilizing and improving the performance of the SLC at SLAC. It requires information from diagnostic devices being available on a pulse-by-pulse basis, being processed and filtered in real-time, and the processed results sent to correctors, phase shifters, etc for action on subsequent pulses. Implementing this type of feedback does not seem to be in the design approaches of controls and diagnostics. We recommend an accelerator physics evaluation of previous applications of fast feedback and its potential value to the SNS. It could impact the design approach of diagnostics and controls. A visit from SLAC experts in this field would be a good way to initiate this evaluation.

Applications programming is receiving increased emphasis, and there has been significant improvement with regard to staffing, organization, etc. Important infrastructure tasks such as specifying and populating the database are in progress. A high level programming infrastructure has been started, and a virtual accelerator that simulates the accelerator using the EPICS channel access server is available. Sample applications have been coded. The commissioning plans are giving important guidance with information on priorities and date requirements.

Laser Wire Monitor

We were asked to comment specifically on the laser wire profile monitor. The concept is an attractive one because it offers the promise of being able to tune the accelerator with a full intensity, full duty cycle beam. In contrast standard wire scanners require special beam conditions and may possibly produce unacceptable dust and debris in the superconducting cavities.

Unfortunately the design and understanding of the laser wire profile monitors are not sufficiently advanced at the present time. Basic system concepts need to be determined, and scanners need to be designed and tested. It is unlikely that this can be completed by April when a decision must be made. Therefore, laser wire profile monitors cannot be considered a viable alternative to wire scanners. However, they are attractive for the long term and they could be installed at a later time without major rework. Therefore, they should receive additional R&D funds.

Spallation Neutron Source ASAC Review
SNS Project Office, Room 101A/B, Oak Ridge
February 12-14, 2002

Agenda

Tuesday, February 12

8:00	Closed Session		30
8:30	Welcome, Charge and Project Status	T. Mason	30
9:00	SNS Accelerator Systems Overview	N. Holtkamp	45
9:45	Accelerator Physics Overview	J. Wei	45
10:30	Break		15
Beam Commissioning Presentations			
10:45	Resources for Beam Commissioning	D. Olsen	25
11:10	Accelerator Beam Commissioning Plan	G. Dodson	25
11:35	Controls Progress and Commissioning	D. Gurd	25
12:00	Lunch		60
13:00	Diagnostics Progress	T. Shea	30
13:30	Diagnostics Requirements for Commissioning	S. Assadi	30
14:00	Laser Wire Development	P. Cameron	30
14:30	Discussion of Laser Wire		15
14:45	Front-End Commissioning	A. Alexandrov	30
15:15	Break		15
15:30	DTL-CCL Commissioning	E. Tanke	30
16:00	SRFL Commissioning	J. Stovall	25
16:25	HEBT, Ring and RTBT Commissioning	S. Henderson	25
16:50	Beam Applications Software	J. Galambos	25
17:15	RATS Tour		
19:00	Conference Dinner		

Wednesday, February 13

8:00	Closed Session		30
Front End Presentations			
8:30	Front End Progress, Performance and Outlook	R. Keller	30
9:00	SNS Ion Source Group Status	M. Stockli	30
9:30	Initial Full-Energy Beam Performance and Emittance Measurements of the SNS RFQ	J. Staples	30
10:00	Break		15
Linac Presentations			
10:15	Linac Overview and Progress	D. Rej	30
10:45	RF System Procurements, Prototyping & Testing	M. Lynch	30
11:15	Linac Physics Overview	J. Stovall	30
11:45	Lunch		60

12:45	Linac Halo Mitigation	D. Jeon	30
13:15	Cryogenic Linac Overview and Progress	C. Rode	30
13:45	Cryomodule Assembly	J. Preble	30
14:15	Break		15
14:30	Lorentz Force Detuning Overview	M. Champion	30
15:00	Piezo Tuner Design	S. Smee	20
15:20	LLRF Controls	A. Regan	30
15:50	Discussion of Lorentz Force Detuning Issues		15
16:05	Site Tour		60
17:05	Closed Session		

Thursday, February 14

8:00	Closed Session		30
HEBT-Ring-RTBT Presentation			
8:30	Ring Overview and Progress	Y. Lee	30
9:00	Impedance Measurement and Kicker Optimization	D. Davino	30
9:30	Instabilities and electron cloud effects	M. Blaskiewicz	30
10:00	Break		15
10:15	Magnet Modeling and Measurements	N. Tsoupas	30
10:45	Dynamic Aperture and Computer Simulations	A. Fedotov	30
11:15	SNS RAMI Analysis Continued	G. Dodson	30
11:45	Closed Session and Lunch		120
13:45	Closeout		60
14:45	Departure		